



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/551,147	09/22/2005	Robert Bruce Grant	M02B166	3951
71134 7590 05/14/2010				
Edwards Vacuum, Inc. 2041 MISSION COLLEGE BOULEVARD SUITE 260 SANTA CLARA, CA 95054				
EXAMINER				
RIPA, BRYAN D				
ART UNIT		PAPER NUMBER		
1795				
NOTIFICATION DATE		DELIVERY MODE		
05/14/2010		ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

LORETTA.SANDOVAL@EDWARDSVACUUM.COM

Office Action Summary

Application No.

10/551,147

Applicant(s)

GRANT ET AL.

Examiner

BRYAN D. RIPA

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 March 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 4-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 4-44 is/are rejected.
- 7) ☒ Claim(s) 4-7 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/22)
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 4, 2010 has been entered.

Response to Amendment

In response to the amendment received on March 4, 2010:

- claims 1 and 4-44 are presently pending
- all prior art rejections are withdrawn in light of the amendments to the claims
- new grounds of rejection are presented below

Claim Objections

1. Claims 4 and 6 are objected to because of the following informalities: claims 4 and 6 each depend from canceled claim 2.

Please note, for examination purposes the claims were treated as though they depended from claim 1

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 21-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Specifically, claims 21-23 relate to the embodiments of the invention in which there is a liquid state source of the ionic species. However, the Examiner is of the opinion that the specification cannot be reasonably said to convey to one of ordinary skill in the art that the Applicant contemplated the use of the heater in the embodiments employing a liquid state source of the ionic species. As discussed in Applicant's specification, the specification would teach one of ordinary skill in the art to employ the heater in the embodiments where it is known in the art to require the solid state ionic species conductor to be at a particular temperature in order for the conductor to function, i.e. to conduct the particular ionic species (see ¶18 teaching the sensor optionally further including the heater device).

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 26 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

More specifically, claim 26 recites several solid state species conductors for conducting H^+ ions with the first three compounds having an oxygen atom with either "3-x" or "9-x" (see second and third lines of claim 26). However, it is unclear what x is and it is consequently unclear what exact compounds are meant to be covered by the claim.

Please note, the specification also contains the same wording without providing any further clarification as to what x means. As a result, the Examiner will be interpreting the x to be any number between 0 and 3.0 or 0 and 9.0.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1, 4-10, 27, 28, 32, 33 and 38-44 are rejected under 35 U.S.C. 102(b) as being anticipated by Gruner et al., (U.S. Pat. No. 4,219,399) (hereinafter referred to as "GRUNER") with evidence from Masson et al., (U.S. Pat. No. 4,749,466) as to claims 38-44 only (hereinafter referred to as "MASSON").

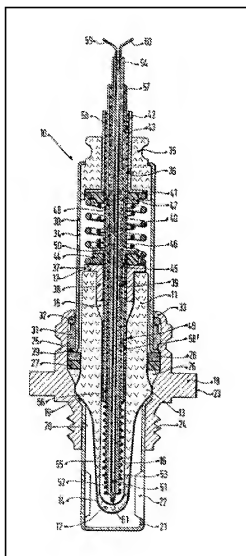
Regarding claim 1, GRUNER teaches a sensor capable of use in a vacuum environment (see generally col. 1 lines 5-10 teaching the sensor being an

electrochemical sensing element for determining the oxygen content of a gas) the sensor comprising:

- an electrochemical cell further comprising:
 - o a measurement electrode comprising a catalyst selected for its ability to catalyze the dissociation of a contaminant molecule into its ionic species (see catalyzing layer 14; see also col. 2 lines 60-65 teaching the electrode being made of platinum);
 - o a reference electrode comprising a catalyst selected for its ability to catalyze the dissociation of a reference molecule into its ionic species (see conductive path 16; see also col. 3 lines 8-13 teaching the electrode being made of platinum); and
 - o a solid-state ionic species conductor bridging the measurement electrode and the reference electrode, the conductor being selected to conduct an ionic species common to the dissociated contaminant and reference molecules (see solid electrolyte tube 11; see also col. 2 lines 51-54 teaching the electrolyte tube being ion conductive); and
- means for initiating catalysis of the dissociation of the references and contaminant molecules (see col. 2 lines 60-65 and col. 3 lines 8-13 teaching the electrodes being made of platinum) wherein the means for initiating comprises means for controlling and monitoring the temperature of the cell (see heater element 55 and temperature sensor 61; see also col. 5 line 63-col. 6 line 4); and

Art Unit: 1795

- means for separating a reference environment space from a monitored environment space (see solid electrolyte tube 11 configured so as to provide an inner reference space separate from the monitored gas space), wherein the means for controlling and monitoring the temperature of the cell includes a heating device contained within the reference environment space (see heater element 55 located within the inside of solid electrolyte tube 11; see also col. 4 lines 23-47). See figure below.



Please note, the phrase "means for initiating catalysis of the dissociation of the reference and contaminant molecules" invokes 35 U.S.C. §112 6th paragraph. As a result, the examiner is interpreting the phrase in accordance with paragraphs 13 and 18 of the specification which teaches the electrodes either being made of or coated with a material able to catalyze the dissociation of the ionic species of interest.

Also, the phrase "means for controlling and monitoring the temperature of the cell" invokes 35 U.S.C. §112 6th paragraph. As a result, the examiner is interpreting the phrase in accordance with paragraph 19 of the specification which describes the means for controlling and monitoring the temperature of the cell to entail a heater with a temperature sensor.

Additionally, the phrase "means for separating a reference environment space from a monitored environment space" invokes 35 U.S.C. §112 6th paragraph. As a result, the examiner is interpreting the phrase in accordance with figure 2 of the specification which teaches the ionic species conductor acting to separate the reference environment space from the monitored environment space.

Regarding claim 4, GRUNER teaches the contaminant molecule sensor wherein the means for controlling and monitoring the temperature including an electrically powered heater (see heater element 55; see also heating connection 54 and heating terminal 57).

Regarding claim 5, GRUNER teaches the contaminant molecule sensor wherein the electrically powered heater comprises wire (see heating element 55 comprising a wire wound around insulating sleeve 53 and metallic tube 52).

Regarding claim 6, GRUNER teaches the contaminant molecule sensor wherein the means for controlling and monitoring the temperature includes a temperature sensor (see temperature sensor 61; see also col. 5 lines 63-66).

Regarding claim 7, GRUNER teaches the contaminant molecule sensor wherein the temperature sensor is a thermocouple (see col. 5 line 66-col. 6 line 1 teaching temperature sensor 61 comprising a thermocouple).

Regarding claim 8, GRUNER teaches the contaminant molecule sensor comprising a vacuum feed-through connection for providing an electrical connection to the measurement electrode (see col. 4 lines 15-19 teaching the electrical connection with catalyzing layer 14 occurring through housing 18 by electrical connection of layer 14 with metallic washer 28).

Regarding claim 9, GRUNER teaches the contaminant molecule sensor comprising seals for connection to a vacuum environment (see housing 18 with thread 24 for connection to a gas environment to be measured which is capable of being connected to a vacuum environment as claimed).

Regarding claim 10, GRUNER teaches the contaminant molecule sensor wherein a reference environment space is at least partly bounded by the reference electrode and is open to the ambient atmosphere (see inner surface of solid electrolyte tube 11 having conductive path 16 which acts as the reference electrode partly bounding the reference environment space; and see also col. 3 lines 54-60 teaching the reference environment space being open to the atmosphere so as to allow the use of atmospheric gas as the reference gas).

Regarding claim 27, GRUNER teaches the contaminant molecule sensor wherein the solid-state ionic species conductor conducts O^{2-} ions (see col. 1 lines 5-10 and col. 2 lines 51-54 teaching the electrochemical sensor being used to determine oxygen content with a solid electrolyte tube made of stabilized zirconium dioxide which is known in the art to be used to conduct O^{2-} ions as claimed).

Regarding claim 28, GRUNER teaches the contaminant molecule sensor wherein the solid-state ionic species conductor comprises yttria stabilized zirconia (see col. 2 lines 51-54 implicitly teaching the use of a solid electrolyte tube of yttria stabilized zirconia).

Regarding claim 32, GRUNER teaches the contaminant molecule sensor wherein the catalyst for the measurement electrode is the same as the catalyst for the

reference electrode (see col. 2 lines 60-65 and col. 3 lines 8-13 teaching both the electrodes being made of platinum).

Regarding claim 33, GRUNER teaches the contaminant molecule sensor wherein at least one of the catalysts comprises platinum (see col. 2 lines 60-65 and col. 3 lines 8-13 teaching both the electrodes being made of platinum).

Regarding claim 38, GRUNER, as evidenced by MASSON, teaches the contaminant molecule sensor comprising means for monitoring a parameter of an electrical current produced in the cell and means for calculating from the monitored parameter the partial pressure of the contaminant molecule in an environment on a side of the cell bounded by the measurement electrode relative to that on a side of the cell bounded by the reference electrode (see figure from GRUNER and see also MASSON at col. 3 lines 35-52 teaching the use of the Nernst equation so as to be able to calculate from the monitored sensor voltage the partial pressure of oxygen in the measurement gas).

Please note, the phrase "means for monitoring a parameter of an electrical current produced in the cell" invokes 35 U.S.C. §112 6th paragraph. As a result, the examiner is interpreting the phrase in accordance with paragraph 12 and 35 of the specification as requiring the sensor to be configured so as to operate in a potentiometric mode.

Also, the phrase “means for calculating from the monitored parameter the partial pressure of the contaminant molecule in an environment on a side of the cell bounded by the measurement electrode relative to that on a side of the cell bounded by the reference electrode” invokes 35 U.S.C. §112 6th paragraph. As a result, the examiner is interpreting the phrase in accordance with paragraphs 37–39 of the specification which discusses the use of a microprocessor to calculate the partial pressure of the contaminant molecule.

Regarding claim 39, GRUNER, as evidenced by MASSON, teaches the contaminant molecule sensor comprising an EMF measuring device electrically connected to the reference and measuring electrodes (see MASSON at col. 6 lines 19-20 teaching that GRUNER inherently comprises electrodes connected to a voltage measuring device as claimed).

Regarding claim 40, GRUNER, as evidenced by MASSON, teaches a method of detecting or monitoring the presence of a contaminant molecule in a monitored environment (see generally col. 1 lines 5-10 teaching the sensor being used as an electrochemical sensing element for determining the oxygen content of a gas) the method comprising:

- an electrochemical cell further comprising:
 - o a measurement electrode comprising a catalyst selected for its ability to catalyze the dissociation of a contaminant molecule into its ionic species

- (see catalyzing layer 14; see also col. 2 lines 60-65 teaching the electrode being made of platinum);
- o a reference electrode comprising a catalyst selected for its ability to catalyze the dissociation of a reference molecule into its ionic species in a reference environment (see conductive path 16; see also col. 3 lines 8-13 teaching the electrode being made of platinum); and
 - o a solid-state ionic species conductor bridging the measurement electrode and the reference electrode, the conductor being selected to conduct an ionic species common to the dissociated contaminant and reference molecules (see solid electrolyte tube 11; see also col. 2 lines 51-54 teaching the electrolyte tube being ion conductive); and
- providing on a side of the cell bounded by the reference electrode a source of the reference molecules (see solid electrolyte tube 11 configured so as to provide an inner reference space separate from the monitored gas space);
 - initiating the catalysis of the dissociation of the references and contaminant molecules (see col. 2 lines 60-65 and col. 3 lines 8-13 teaching the electrodes being made of platinum) using a heating device contained within the reference environment separated from the monitored environment (see heater element 55 located within the inside of solid electrolyte tube 11; see also col. 4 lines 23-47); and
 - monitoring a parameter of an electrical current produced in the cell (see); and calculating from the monitored parameter the partial pressure of the contaminant

molecule in an environment side of the cell bounded by the measurement electrode relative to that on the side of the cell bounded by the reference electrode (see figure from GRUNER and see also MASSON at col. 3 lines 35-52 evidencing that it is known in the art to use the Nernst equation so as to be able to calculate from the monitored sensor voltage the partial pressure of oxygen in the measurement gas as claimed). See figure from GRUNER above.

Regarding claim 41, GRUNER, as evidenced by MASSON, teaches the method of detecting and monitoring the presence of a contaminant molecule in a monitored environment wherein the monitored parameter is EMF (see MASSON at col. 6 lines 19-20 teaching that GRUNER inherently comprises electrodes connected to a voltage measuring device to monitor the EMF produced in the electrochemical cell as claimed)

Regarding claim 42, GRUNER teaches the method of detecting and monitoring the presence of a contaminant molecule in a monitored environment wherein catalysis of the contaminant molecule is initiated by heating the cell (see col. 1 lines 14-18 teaching the requirement to heat ion conductive solid electrolyte above 400°C in order to allow for ion conductivity through the electrolyte).

Regarding claim 43, GRUNER teaches the method of detecting and monitoring the presence of a contaminant molecule in a monitored environment wherein the reference molecule is the same as the contaminant molecule (see col. 3 lines 54-60

teaching the use of atmospheric gas containing oxygen as the reference molecule when detecting oxygen in the monitored gas).

Regarding claim 44, GRUNER teaches the method of detecting and monitoring the presence of a contaminant molecule in a monitored environment wherein the catalyst for the measurement electrode is the same as the catalyst for the reference electrode (see col. 2 lines 60-65 and col. 3 lines 8-13 teaching the electrodes being made of platinum).

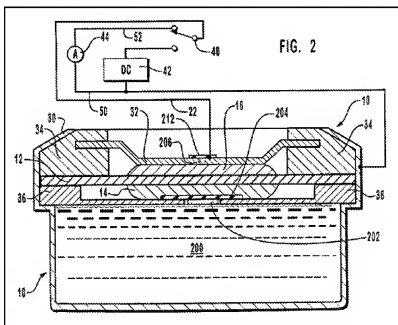
Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1, 11, 21, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shen in view of Shen et al., (U.S. Pat. No. 6,200,443) (hereinafter referred to as "SHEN II") with evidence from Erdosy et al., (W.I.P.O Pub. No. 02/077641 A2) (hereinafter referred to as "ERDOSY").

Regarding claim 1, SHEN teaches a contaminant molecule sensor capable of use in a vacuum environment wherein the sensor comprises an electrochemical cell (see col. 4 lines 20-28) having a measurement electrode (sensing electrode 16), a reference electrode (counter electrode 14), a solid-state ionic species conductor

(protonic conductive membrane 12) bridging the measurement electrode and the reference electrode, means for initiating the catalysis of the dissociation of the reference and contaminant molecules (see col. 9 lines 14–40 discussing the making of counter electrode 14 and sensing electrode 16 with a platinum thin film), and means for separating a reference environment space from a monitored environment space (see protonic conductive membrane 12 acting so as to separate the reference environment space, i.e. the space below membrane 12 including reservoir 200, from the monitored environment space above sensing electrode 16). See figure 2 below.



Shen fails to explicitly teach the means for initiating catalysis further comprising means for controlling and monitoring the temperature of the cell and wherein the means for controlling and monitoring the temperature of the cell includes a heating device contained within the reference environment space.

However, SHEN II teaches that it is known to include a means for controlling and monitoring the temperature of the cell as claimed (see col. 10 line 50-col. 11 line 6 teaching the use of a heater and temperature sensor so as to allow for the use of the sensor in lower temperatures). Moreover, as evidenced by ERDOSY, it is known in the art to include a heater and temperature sensor together with a sensor in order to maintain the sensor at a desired optimum temperature (see page 12 lines 20-22 teaching the use of a Peltier-effect device and a thermistor to maintain the sensor at a desired temperature). Consequently, one of ordinary skill in the art would have appreciated that incorporating a heater with a temperature sensor into the sensor of SHEN would allow for not only lower temperature operation of the sensor but also maintaining of the sensor at an optimum detection temperature.

Furthermore, although SHEN II teaches the heater located around the electrodes and the solid electrolyte (see figure 3), it would have been obvious to one of ordinary skill in the art when incorporating the heater of SHEN II into the sensor cartridge of SHEN in order to avoid a complete redesign of the sensor to include the heater either in the upper portion of the reservoir or around counter electrode 14 since the proximity of the heater to the protonic conductive membrane and the reservoir would allow for sufficient heating of the liquid in both.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the heater and temperature sensor of SHEN II into the sensor of SHEN in order to provide for a contaminant molecule sensor having the configuration as claimed.

Regarding claim 11, SHEN teaches the contaminant molecule sensor wherein the reference environment space (the space surrounding reservoir 200) is at least partially bounded by the reference electrode (counter electrode 14) and is enclosed by a seal (see the configuration of washer 36 placed in can 30 in combination with cap 32 which act as a seal to enclose the reference environment space). See figure 2 above.

Regarding claims 21, SHEN teaches the contaminant molecule sensor having in the reference environment space a liquid state source of the ionic species (see col. 7 lines 3–5 discussing reservoir 200 being filled with deionized water providing hydrogen ions for the electrochemical detection of the analyte gas). See figure 2 above.

Regarding claim 25, SHEN teaches the contaminant molecule sensor where the solid-state ionic species conductor (protonic conductive membrane 12) conducts hydrogen ions. See figure 2 above from SHEN.

Regarding claim 26, SHEN teaches the contaminant molecule sensor where the solid-state ionic species conductor is NAFION (see col. 8 lines 26–30).

6. Claims 11-13, 15-18, 24, 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over GRUNER as applied to claim 1 above, and further in view of Gur et al., (U.S. Pat. No. 5,827,415) (hereinafter referred to as "GUR").

Regarding claims 11 and 13, while GRUNER teaches the reference environment space at least partially bounded by the reference electrode (see conductive path 16), GRUNER does not teach the contaminant molecule sensor wherein a reference environment space is enclosed by a seal and contains a solid-state source of the reference molecules. Instead, since GRUNER relies on atmospheric gas as a reference gas for the sensor the sensor requires an opening to allow the gas to diffuse into the reference environment space (see air admission opening 34 and discussion at col. 3 lines 54-64).

However, GUR teaches a contaminant molecule sensor wherein the reference space contains a solid-state source of the reference molecules and is enclosed by a seal (see col. 5 lines 7-20 teaching the use of a metal-metal oxide reference electrode to provide the reference gas that is completely encapsulated and isolated from the measurement gas).

Consequently, as shown by GUR, a person of ordinary skill in the art would accordingly have recognized the use of a self-contained solid-state source of the reference molecules that is enclosed by a seal as a means of providing the necessary reference gas in a Nernstian sensor.

Moreover, the sensor of GUR operates on the same principal as the sensor of GRUNER, i.e. the Nernst Equation, (see col. 3 lines 10-14) but can avoid having an opening to the atmosphere due to the fact that it has a self-contained reference gas (see col. 4 line 66-col. 5 line 2). As taught by GUR, this design change allows for some substantial benefits over the previous sensors, like that of GRUNER, which required the

use of atmospheric gas as a reference gas (see col. 3 lines 6-24 teaching the benefit of the self contained reference gas allowing for a smaller more versatile sensor that can operate in a wider array of environments and conditions).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to utilize the sealed solid-state source of the reference molecules as taught by GUR in the sensor of GRUNER since doing so would yield the predictable result of allowing the sensor of GRUNER to produced in a smaller size and additionally allow for the use of the sensor in a wider range of environments and conditions.

Regarding claim 12, GUR teaches the contaminant molecule sensor with the electrical cables for connecting the electrodes and optionally the electric heating means with an electrical circuit passing through the seal (see figure 3 above showing the electrode lead connections for both the reference and the sensing electrode passing through the glass seal).

Regarding claim 15, GUR teaches the contaminant molecule sensor having in the reference environment space a solid-state source of the reference material comprising a metal and a metal oxide (see col. 4 lines 29–32 describing the metal-metal oxide material used as the solid-state source of the reference gas, i.e. a powder). GUR further teaches the ionic species to be conducted being O^{2-} and the solid-state source being a metal and a metal oxide material (see col. 2 lines 24–42).

Regarding claims 16–18, GUR teaches the contaminant molecule sensor wherein the metal is copper, chromium, or nickel and where the oxide is copper oxide, chromium oxide, or nickel oxide (see col. 7 lines 61–66).

Regarding claim 24, GUR teaches the contaminant molecule sensor having in the reference environment space a gaseous-state source of the ionic species (see col. 8 lines 4–17; col. 2 lines 24–42 describing how the metal/metal oxide layer acts to produce oxygen gas at a known pressure for a given temperature and, further, that the gaseous oxygen is then catalyzed to an ionic species after contacting the metal electrode surface).

Regarding claim 34, GUR teaches the contaminant molecule sensor with the catalyst for the reference electrode comprising ruthenium (see col. 7 line 67 teaching the use of Ru/RuO for use in the reference electrode).

Regarding claim 35, GUR teaches the contaminant molecule sensor with the catalyst for the measurement electrode being gold (see col. 8 lines 25–26).

Regarding claim 36, GUR teaches the contaminant molecule sensor with the catalyst for the reference electrode comprising a catalyzing oxide (see col. 8 line 2 teaching the use of Pt/PtO for use in the reference electrode).

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over GRUNER in view of GUR as applied to claims 1, 11 and 13 above, and further in view of Tiwari (U.S. Pat. No. 4,882,032) (hereinafter referred to as "TIWARI").

Regarding claim 14, GRUNER as modified by GUR does not teach the ionic species being conducted being a hydrogen ion and the solid-state source being selected from a metal, metal hydride, a metal alloy/metal hydride, any hydrated species and any organic species.

However, TIWARI teaches an electrochemical sensor where the ionic species being conducted is a hydrogen ion (col. 1 lines 63–65) and the solid state source is from a metal hydride (col. 3 lines 19–30) in the detection of hydrogen gas.

Consequently, as shown by TIWARI, a person of ordinary skill in the art would accordingly have recognized the use of a metal hydride as the solid state source of hydrogen ions when attempting to develop a sensor for the detection of other analytes besides oxygen.

Applying a known technique to a known device (method or product) ready for improvement to yield predictable results is likely to be obvious. See *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395–97 (2007) (see MPEP § 2143, D.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the solid state source of TIWARI with the sensor of GUR to provide for the predictable result of having hydrogen ions being the ionic species to

be conducted and having the solid state source comprising a metal hydride to facilitate the use of the sensor in broader sensing applications.

8. Claims 19, 20, 29–31 are rejected under 35 U.S.C. 103(a) as being unpatentable over GRUNER in view of GUR as applied to claims 1, 11 and 13, and further in view of Hitchman et al. (U.S. Pat. No. 6,365,022) (hereinafter referred to as "HITCHMAN").

Regarding claims 19, 20 and 29–31 GRUNER as modified by GUR does not teach the ionic species to be conducted being silver ions and the solid state source being a silver salt.

However, HITCHMAN teaches the ionic species to be conducted being silver ions (see col. 2 lines 22–23) and the solid state source being a silver salt (see col. 3 lines 2–3 describing the solid state source as a silver salt) in the electrochemical detection of carbon dioxide.

Consequently, as shown by HITCHMAN, a person of ordinary skill in the art would accordingly have recognized the use silver ions as the ionic species to be conducted and the use of a silver salt as the solid state source when attempting to develop a sensor for the detection of other analytes besides oxygen.

Applying a known technique to a known device (method or product) ready for improvement to yield predictable results is likely to be obvious. See *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395–97 (2007) (see MPEP § 2143, D.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the solid state source of HITCHMAN with the sensor of GUR to provide for the predictable result of having silver ions being the ionic species to be conducted and the solid state source being a silver salt to facilitate the use of the sensor in broader sensing applications.

9. Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over SHEN in view of SHEN II as applied to claims 1, 11 and 21 above, and further in view of Stetter et al. (U.S. Pat. No. 5,331,310) (hereinafter referred to as "STETTER").

Regarding claim 22, although SHEN does teach the ionic species being conducted being a hydrogen ion, SHEN as modified by SHEN II does not teach the liquid state source of the ionic species comprising a liquid acid.

However, STETTER teaches the use of sulfuric acid as a liquid state source of the ionic species (see col. 4 lines 25–26).

Consequently, as shown by STETTER, one of ordinary skill in the art would accordingly have recognized the use of the liquid state source being a liquid acid.

The combination of familiar elements is likely to be obvious when it does no more than yield predictable results. See *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395–97 (2007) (see MPEP § 2143, A.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the liquid state source of SHEN with the liquid state

source of STETTER to obtain the predictable result of providing hydrogen ions through having the liquid state source of the ionic species being a liquid acid.

Regarding claim 23, SHEN as modified by STETTER does not teach the liquid state source of the hydrogen ions being an organic liquid.

However, one of ordinary skill in the art would have been aware of the possibility of using an organic liquid, i.e. an organic acid, instead of an inorganic acid as taught by STETTER.

Consequently, a person of ordinary skill in the art would accordingly have recognized the use of either an organic acid or an inorganic acid based on the disclosure of STETTER.

The simple substitution of one known element for another is likely to be obvious when predictable results are achieved. See *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395–97 (2007) (see MPEP § 2143, B.). Furthermore, the selection of a known material, which is based upon its suitability for the intended use, is within the ambit of one of ordinary skill in the art. See *In re Leshin*, 125 USPQ 416 (CCPA 1960) (see MPEP § 2144.07).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the inorganic acid of STETTER with an organic acid as the liquid state source of the hydrogen ions.

10. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over GRUNER as modified by GUR as applied to claims 1, 11 and 13 above, and further in view of Razumney (U.S. Pat. No. 4,370,206) (hereinafter referred to as "RAZUMNEY").

Regarding claim 37, GRUNER as modified by GUR does not teach one of the catalysts comprising a silver salt.

However, RAZUMNEY teaches the catalyst comprising a silver salt (see abstract).

Consequently, as shown by RAZUMNEY, a person of ordinary skill in the art would accordingly have recognized the use of a catalyst comprising a silver salt to facilitate the electrochemical detection of the analyte gas.

The simple substitution of one known element for another is likely to be obvious when predictable results are achieved. See *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395–97 (2007) (see MPEP § 2143, B.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the catalyst of GUR for the catalyst of RAZUMNEY in order to obtain the predictable result of providing an appropriate material, a silver salt, to favor dissociation of the ions of interest.

Response to Arguments

Applicant's arguments with respect to claims 1 and 4-44 have been considered but are moot in view of the new ground(s) of rejection.

Specifically, as to Applicant's arguments relating to the use of FLAIS, the Examiner agrees with Applicant's remarks (see page 12) that FLAIS does not teach the heating device contained within the reference environment space as required by the claim. This is because the claim limitation requiring the means for separating a reference environment space from a monitored environment space, which is being interpreted in accordance with figure 2 of the disclosure, requires the conductor to form the required separation between the reference environment space and the monitored environment space. Consequently, as argued by Applicant, FLAIS teaches the heater contained outside the reference environment space.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- 1) U.S. Pat. No. 5,876,578 to Yamauchi et al., which teaches a Nernstian electrochemical sensor for detecting HF gas employing a metal-metal hydride reference electrode for generating a reference gas with Ag^+ solid electrolyte conductor.
- 2) U.S. Pat. No. 6,517,693 to Taniguchi, which teaches a H^+ ion conductor made of a $\text{CaZr}_{1-x}\text{In}_x\text{O}_3$ amongst others.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRYAN D. RIPA whose telephone number is 571-270-7875. The examiner can normally be reached on Monday to Friday, 9:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. D. R./
Examiner, Art Unit 1795

/Alexa D. Neckel/
Supervisory Patent Examiner, Art Unit 1795